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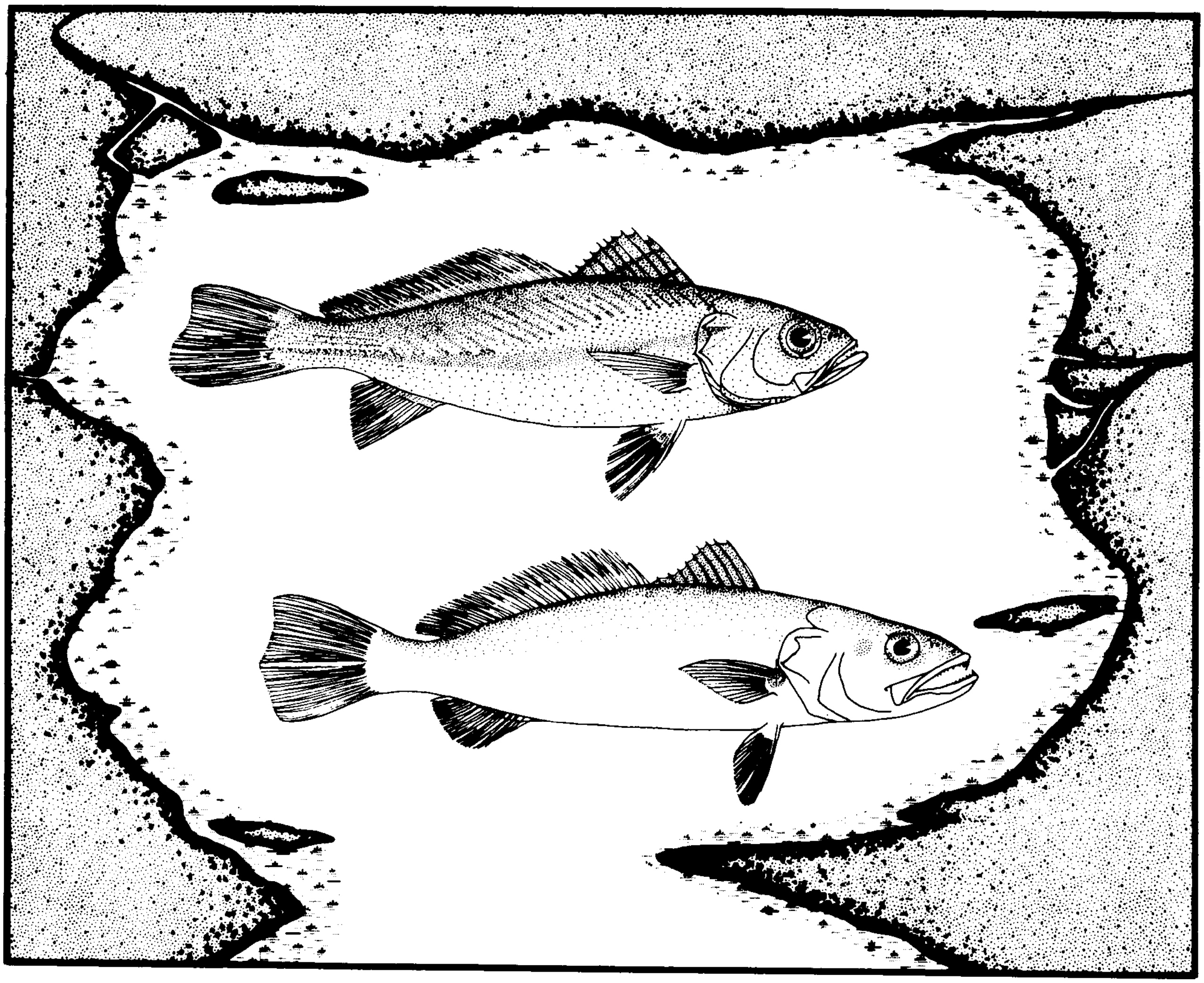
March 1987

TR EL-82-4

Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Gulf of Mexico)

SAND SEATROUT AND SILVER SEATROUT



Fish and Wildlife Service
U.S. Department of the Interior

Coastal Ecology Group
Waterways Experiment Station
U.S. Army Corps of Engineers

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Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Gulf of Mexico)

SAND SEATROUT AND SILVER SEATROUT

by

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PREFACE

This species profile is one of a series on coastal aquatic organisms, principally fish, of sport, commercial, or ecological importance. The profiles are designed to provide coastal managers, engineers, and biologists with a brief comprehensive sketch of the biological characteristics and environmental requirements of the species and to describe how populations of the species may be expected to react to environmental changes caused by coastal development. Each profile has sections on taxonomy, life history, ecological role, environmental requirements, and economic importance, if applicable. A three-ring binder is used for this series so that new profiles can be added as they are prepared. This project is jointly planned and financed by the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service.

Suggestions or questions regarding this report should be directed to one of the following addresses.

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Attention: WESER-C
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Vicksburg, MS 39180

CONVERSION TABLE

Metric to U.S. Customary

Multiply	By	To Obtain
millimeters (mm)	0.03937	inches
centimeters (cm)	0.3937	inches
meters (m)	3.281	feet
meters (m)	0.5468	fathoms
kilometers (km)	0.6214	statute miles
kilometers (km)	0.5396	nautical miles
square meters (m^2)	10.76	square feet
square kilometers (km^2)	0.3861	square miles
hectares (ha)	2.471	acres
liters (1)	0.2642	gallons
cubic meters (m^3)	35.31	cubic feet
cubic meters (m^3)	0.0008110	acre-feet
milligrams (mg)	0.00003527	ounces
grams (g)	0.03527	ounces
kilograms (kg)	2.205	pounds
metric tons (t)	2205.0	pounds
metric tons (t)	1.102	short tons
kilocalories (kcal)	3.968	British thermal units
Celsius degrees ("C)	1.8(°C) + 32	Fahrenheit degrees

U.S. Customary to Metric

Multiply	By	To Obtain
inches	25.40	millimeters
inches	2.54	centimeters
feet (ft)	0.3048	meters
fathoms	1.829	meters
statute miles (mi)	1.609	kilometers
nautical miles (nmi)	1.852	kilometers
square feet (ft^2)	0.0929	square meters
square miles (mi^2)	2.590	square kilometers
acres	0.4047	hectares
gallons (gal)	3.785	liters
cubic feet (ft^3)	0.02831	cubic meters
acre-feet	1233.0	cubic meters
ounces (oz)	283.5	milligrams
ounces (oz)	28.35	grams
pounds (lb)	0.4536	kilograms
pounds (lb)	.00045	metric tons
short tons (ton)	0.9072	metric tons
British thermal units (Btu)	0.2520	kilocalories
Fahrenheit degrees (°F)	0.5556(°F - 32)	Celsius degrees

CONTENTS

ACKNOWLEDGEMENTS

We are grateful to H.D. Hoese, University of Southwestern Louisiana, Lafayette, and Thomas Linton, Texas A&M University, College Station, for their review of the manuscript and helpful suggestions.

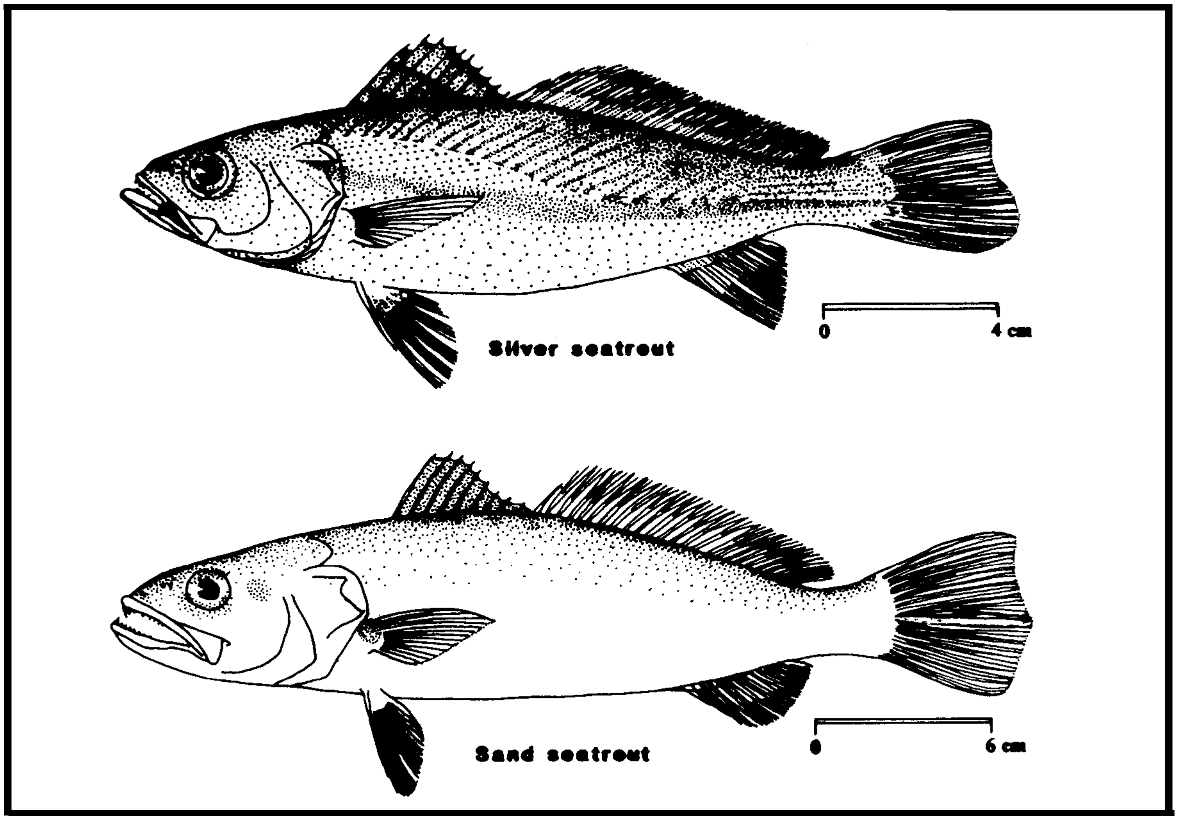

Figure 1. Adult silver seatrout and sand seatrout (from Fischer 1978).

SAND SEATROUT AND SILVER SEATROUT

NOMENCLATURE/TAXONOMY/RANGE

Scientific name ...... Cynoscion arenarius Ginsburg
Preferred common name ...... Sand seatrout (Figure 1)
Other common names ... White trout
Scientific name ..... Cynoscion nothus (Holbrook)
Preferred common name ..... Silver seatrout (Figure 1)
Class .... Osteichthyes
Order .... Perciformes
Family .... Sciaenidae

Geographical range: Sand seatrout are endemic to the Gulf of Mexico (Figure 2), and are found from southwest Florida (Roessler 1970) to the Bay of Campeche (Hildebrand 1955). The range of the silver seatrout (Figure 3) extends from Chesapeake Bay to the Bay of Campeche (Hildebrand and Schroeder 1928; Hildebrand 1955). It is common on the gulf coast, the east coast of Florida, and as far north as North Carolina.

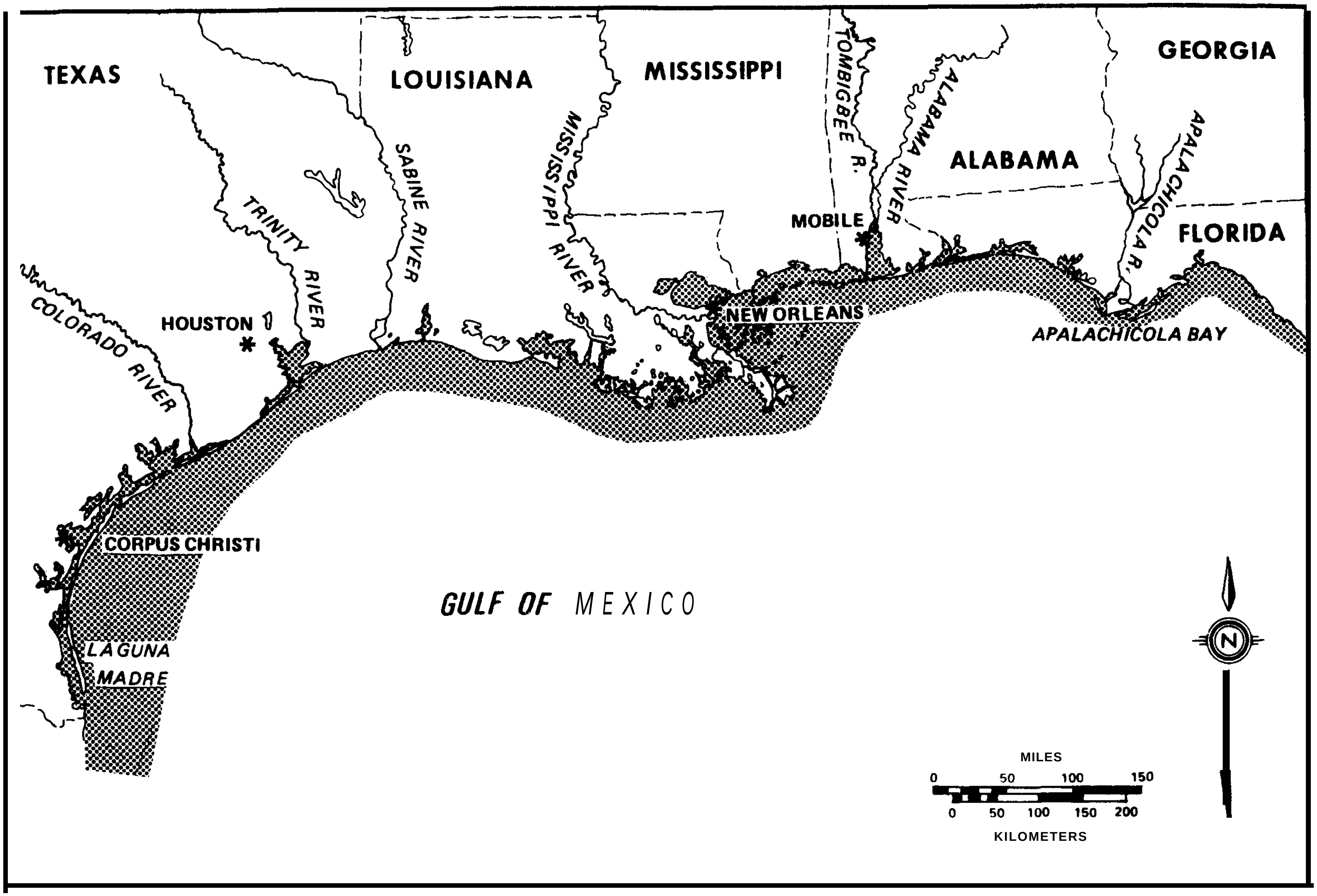

Figure 2. Distribution of sand seatrout in the Gulf of Mexico.

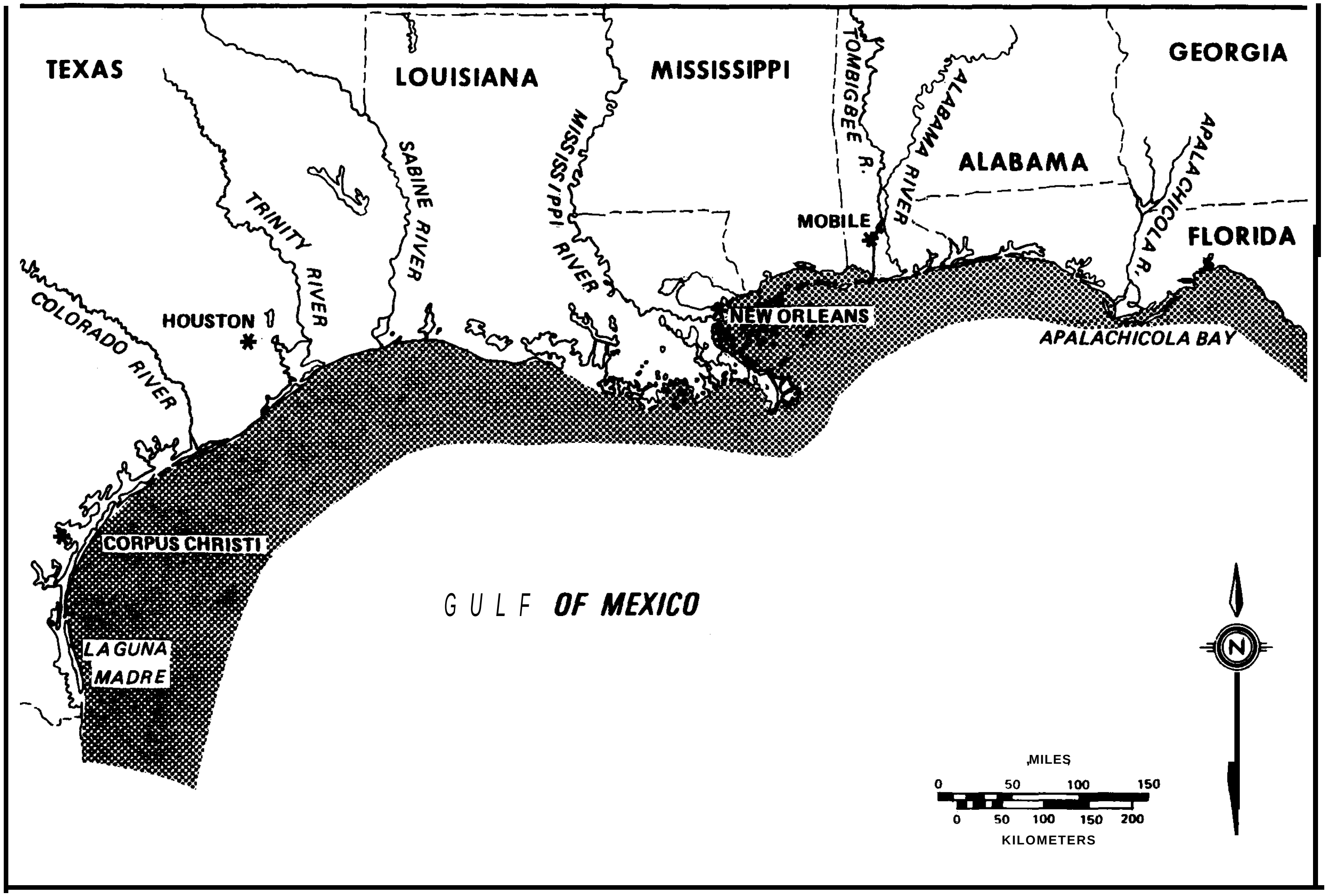

Figure 3. Distribution of silver seatrout in Gulf of Mexico.

MORPHOLOGY/IDENTIFICATION AIDS

The following morphological descriptions of sand seatrout and silver seatrout were given by Guest and Gunter (1958).

Cynoscion arenarius Ginsburg

Vertebrae 25. Soft anal rays 11, sometimes 10 or 12. Dorsal soft rays modal number 26, commonly 25 or 27. Total number of gill rakers usually 14 or 13, but frequently 15. The usual number of gill rakers on the two limbs of the first arch is 4 + 10 or 3 + 10. Caudal not emarginate in individuals over 300 mm long, the middle rays being somewhat longer. Least depth of caudal peduncle usually shorter than snout; 1.57 to 1.82 in maxillary. Color pale, without well-defined spots, yellowish above, silvery below, the center of the scales above level of gill opening sometimes having faint oblique rows of cloudy areas. Back cloudy in young, the cloudy areas tending to form indefinite cross bands.

Cynoscion nothus (Holbrook)

Vertebrae nearly always 27, rarely 26. Anal soft rays predominately 9, sometimes 8 and infrequently 10 in specimens from the Atlantic coast. Dorsal rather long, the usual number of soft rays 28 or 29, frequently 27, less frequently 30; the number of rays increasing in more northern latitudes, the mode being 28 in gulf specimens. Total number of gill rakers on the first arch in specimens 30 to 130 mm long have a mode of 13, frequently 12 or 14, rarely 15. Most common number of gill rakers on first arch 3 + 10. Snout shorter than the least depth of caudal peduncle. Caudal peduncle short, the length of the maxillary greater than the distance from posterior end of insertion of dorsal to base of caudal on midline. Eye conspicuously larger than in sand seatrout. Color pale, without conspicuous pigmentation, the upper part usually straw or walnut, the lower part lighter silvery; sometimes an indication of irregular rows of faint spots. In small individuals, up to about 85 mm standard length (SL), the upper part is more or less faintly clouded, the cloudy areas tending to form transverse bands.

Sand seatrout and silver seatrout are sometimes difficult to distinguish (Guest and Gunter 1958; Daniels 1977). Ginsburg (1929) presented a key to aid the identification of these species. Gunter (1945) noted that the silver seatrout has ctenoid scales, which make it feel rougher to the touch than sand seatrout.

REASON FOR INCLUSION IN THE SERIES

The sand seatrout is one of the most abundant fishes in the estuarine and nearshore waters of the gulf (Gunter 1945; Christmas and Waller 1973). It is a valuable recreational species (Moffett et al. 1979) and a major component of the industrial bottom fishery and shrimp bycatch (Roithmayr 1965; Sheridan et al. 1984). Although silver seatrout are abundant in the nearshore waters of the northern Gulf of Mexico (Hildebrand 1954; Moore et al. 1970), little study of this species has been done.

LIFE HISTORY

Spawning

Sand seatrout mature at 140 to 180 mm total length (TL) as they approach age I in gulf waters off Freeport, Texas (Shlossman and Chittenden 1981). Sheridan et al. (1984), working with specimens taken gulf-wide, were able to distinguish males at 84 mm SL and females at 82 mm. The smallest maturing male was 129 nun SL and the smallest female was 140 mm.

Shlossman and Chittenden (1981) identified two spawning peaks for sand seatrout in Texas gulf waters using information from gonad development studies and collections of small fish (20 to 80 mm TL). They proposed a first spawning peak in early March to May (spring), and a second in late summer (August and September). Sheridan et al. (1984) found maturing and ripe fish primarily during March and April, although ripe females were taken in August and males during October. Other studies of sand seatrout have indicated a broad period of spawning during spring and late summer (Franks et al. 1972; Gallaway and Strawn 1974; Moffett et al. 1979).

Sand seatrout spawn in lower estuarine environments or inshore gulf waters. Shlossman and Chittenden (1981) identified spawning locations by analyzing length-frequency gradients from upper estuarine areas (Cedar Bayou, Texas) to Galveston Bay and shallow gulf areas; they found that spawning took place at depths of 7-22 m. Sheridan et al. (1984) collected a higher percentage of ripe and mature fish from samples taken in 56- to 73-m depth strata (38%) than from any other (9 to 17 m, 14%; 18 to 36 m, 15%; 37 to 55 m, 24%; and 79 to 91 m, 21%). Ripe sand seatrout were collected at depths of 73-91 m off Mississippi by Franks et al. (1972). Variation in spawning depths may be due to differences in depths of habitats off Texas and the Mississippi Delta (Sheridan et al. 1984).

Simmons (1951) and Simmons and Hoese (1959) found that mature sand seatrout from Aransas Bay migrated into the gulf through Cedar Bayou during May-August, and that postlarvae and spent adults entered Aransas Bay on incoming tides. Shlossman and Chittenden (1981) noted that the inshore movement of young sand seatrout, in light of the proposed bimodal spawning, coincided with periods of rising sea level in the northern gulf due to surface currents and prevailing inshore winds. The spawning strategy of sand seatrout may be to take advantage of this phenomenon to facilitate the transport of eggs and/or larvae from inshore gulf spawning areas to estuarine and gulf nurseries.

DeVries and Chittenden (1982) reported that silver seatrout mature at 140 to 170 mm SL (age I) in gulf waters off Texas; they also determined that females entered early developmental stages at 100 to 135 mm SL. Sheridan et al. (1984) were able to identify males at 77 mm SL and females at 80 mm, noting an SL of 140 mm for the smallest maturing female.

DeVries and Chittenden (1982) report that spawning of silver seatrout occurs from early May to October in Texas gulf waters and includes two peak periods of spawning activity, one in spring and another in late summer. Each year class may produce three intra-year cohorts, two of which occur in late summer, In other studies in the gulf region, ripe fish were noted in mid-May (Miller 1965) and throughout August (Gunter 1945; Hildebrand 1954). Stuck and Perry (1981) analyzed surface nekton and concurrent bottom trawl samples to determine that spawning of silver seatrout in waters off Mississippi occurred during late summer and fall.

Silver seatrout from waters off Georgia also appear to have two spawning peaks (Mahood 1974), the first in offshore waters during spring and a second closer to shore in late summer and fall.

Sheridan et al. (1984) found ripe females only in April and October in collections taken throughout the northern gulf region; however, maturing females were collected from March to April and August to October, and maturing males from March to October. Their calculations of the gonadal-somatic index (used to indicate reproductive readiness) showed little monthly variation; therefore, spawning may begin earlier than May, the month proposed by DeVries and Chittenden (1982).

DeVries and Chittenden (1982) suggested that silver seatrout use a mechanism of egg or larval transport similar to that discussed by Shlossman and Chittenden (1981) for sand seatrout.

Fecundity

Sheridan et al. (1984) estimated mean fecundity for sand seatrout (140 to 278 mm SL) to be 100,990 eggs, and 73,900 for silver seatrout (140 to 256 mm SL). They also provided the following relationships between fecundity (F) and standard length in mm (SL), weight in g (W), and ovary weight in g (OW):

Sand Seatrout

F
F :: -198,665 + + 759 1,480 r^2 SL; = 0.51 r^2 = 0.36
-8,917 W;
F = 32,557 + 7,893 OW; r^2 = 0.53

Silver Seatrout

F = -362,882 + 2,570 SL; r^2 = 0.76
F = -52,623 + 1,309 W; r^2 = 0.84
F = 32,539 + 5,662 OW; r^2 = 0.94.

Larvae

Daniels (1977) described sand seatrout 1.75 to 8 mm SL taken in Louisiana coastal waters, and Stender (1980) provided data on morphometrics, meristics, pigmentation, and distribution for larval silver seatrout from South Carolina waters. Despite their common occurrence and importance, the early life history of seatrouts from gulf waters has not been adequately studied. Stuck and Perry (1981) described the seasonal occurrence of larval *Cynoscion* spp. as part of an ichthyoplankton survey of Mississippi gulf waters. They were unable to separate sand and silver seatrout larvae because of the limited data available on larval identification.

Juveniles

The use of estuarine areas as nursery grounds by sand seatrout was reported by Shlossman and Chittenden (1981). They noted that groups spawned later in the season returned to estuaries during mid-spring after overwintering in the gulf and stayed until they returned to deeper waters to spawn. The use of estuarine and nearshore waters by juvenile sand seatrout was also noted by Gunter (1945) and Christmas and Waller (1973). Gallaway and Strawn (1974) first observed young-of-the-year fish in Galveston Bay during April and continued to collect them until September. Immigration of juvenile sand seatrout (<30 mm SL) into Mississippi nursery areas began in April or May, and recruitment continued through the summer and fall (Warren and Sutter 1981). Swingle (1971) noted that young sand seatrout appeared in Alabama gulf waters in May and were most abundant in June.

Juvenile silver seatrout are taken in the same general vicinity as adults off Mississippi; the smallest specimens (under 28 mm SL) were taken in June to August and October (Christmas and Waller 1973). The major recruitment of juvenile fish (20 to 80 mm SL) into nursery areas off Mississippi Sound occurred in September (Waller and Sutter 1981). Lengths increased to 110 to 160 mm SL by the following June. In Alabama, smallest fish (33 to 74 mm SL) were taken in September (Swingle 1971), whereas in Texas, small fish were found in June and September to November (Gunter 1945).

Adults

Adult sand seatrout are most abundant in bays, lagoons, and shallow open waters of the gulf (Gunter 1945). Ginsburg (1931) reported that sand seatrout were more common in inner bays, sounds, and shallower offshore waters, while silver seatrout were more abundant farther offshore. Miller (1965) believed that the distribution of the two species overlapped at water depths of 5 to 16 m.

Warren (1981) found sand seatrout to be more than three times as abundant in night samples as in daytime collections (taken at the same locations) during May and June in Mississippi Sound. Larger silver seatrout seem more susceptible to trawling during the day; few fish longer than 100 mm SL are taken at night (DeVries and Chittenden 1982).

Adult silver seatrout are not taken off Texas during winter (December to March). They reappear in spring, which may indicate offshore overwintering of the larger fish (DeVries and Chittenden 1982). Chittenden and McEachran (1976) reported that large silver seatrout (>140 mm) were most abundant in deep gulf waters off Texas in mid-January, but Miller (1965) found larger fish in deep water from February to April. The abundance of silver seatrout in Texas gulf waters increased with distance from shore (Gunter 1938); the fish were common at depths of 10-20 m (Miller 1965) to at least 65 m (Hildebrand 1954).

GROWTH CHARACTERISTICS

Shlossman and Chittenden (1981) aged sand seatrout collected from Texas by length-frequency analysis. Fish that were spawned in the spring averaged 160 to 190 mm TL at 6 months and 220 to 280 mm at age I, whereas those spawned in late summer ranged from 120 to 150 mm TL at 6 months and 210 to 250 mm TL at age I. These mean lengths at age I agree with those of Perret and Caillouet (1974), but exceed those given by Swingle and Bland (1974) and Hoese et al. (1968).

Shlossman and Chittenden (1981) also aged sand seatrout using scale samples. The first annulus formed from April through November, although they noted that fish spawned in spring and late summer may form annuli at different times. Few fish examined had annuli (10%); however, the proportion of fish having annuli increased with length (from 8% at 150 to 199 mm TL, to 24% at 200 to 249 mm, to 52% at 250 to 299 mm, to 71% at $\geq$300 mm).

Barger and Johnson (1980), who examined otoliths, scales, and vertebrae from sand seatrout for indications of annuli, found significant correlations between fish TL in mm (X) and otolith radii ($Y=-1.13 + 0.22X$, $r=0.9$), and TL(X) and number of marks on otoliths ($Y=178.79 + 87.05X$, $r=0.68$). The back-calculated mean lengths at annuli on otoliths were 200 mm TL for one annulus and 247 mm for two annuli.

Maximum size for sand seatrout in Texas gulf waters was estimated to be 342 mm TL (Shlossman and Chittenden 1981), but few fish longer than 300 mm were taken. These results agree with other studies in the gulf (Gunter 1945; Chittenden and McEachran 1976; Christmas and Waller 1973; Perret and Caillouet 1974). Some larger fish, however, have been reported for gulf waters. Franks et al. (1972) and Adkins and Bowman (1976) found sand seatrout with total lengths of 425 to 497 mm, while Trent and Pristas (1977) collected fish of 540 and 590 mm TL in gill net samples from northwest Florida.

The maximum life span of sand seatrout was estimated to be 1 to 2 years for fish taken with trawls and 2 to 3 years for those taken with other gears (Shlossman and Chittenden 1981). Annual mortality (A) was calculated to be near 100% (A=99.79%).

Several studies in the gulf have provided estimates of length-weight relationships for sand seatrout (Table 1).

Monthly increase in total length of sand seatrout was greatest during May to October (35 mm TL/month) and slowest in winter (5-10 mm TL/month), according to Shlossman and Chittenden (1981). Warren (1981) estimated a weekly summer growth rate of 5.8 mm SL for sand seatrout from Mississippi Sound.

OeVries and Chittenden (1982) aged silver seatrout from gulf waters off Texas by length-frequency and scale analyses. They found that silver seatrout reached 130 to 190 mm SL at age I; fish from the dominant fall-spawned groups averaged 145 to 150 mm SL (range 125-170 mm) at 11 months and the May-spawned groups averaged 130 to 190 mm SL at 11-14 months. These values of length at age I agree with those reported by Chittenden and McEachran (1976). Gunter (1945) estimated that fish 75-110 mm SL taken in May were about 1 year old. OeVries and Chittenden (1982) found few annuli on scales they examined. Time of annulus formation for the group spawned in May was the following April to June, after the fish were 130 to 190 mm SL. The time of annulus formation for fish seaward in August or September was not clear, but possibly was April to June as well. The smallest fish with an annulus was 130 mm SL; the proportion of fish with annuli increased with length (16% at 150-159 mm SL, 24% at 160-169 mm, 60% at 170-179 mm and 100% at $\geq$180 mm).

Table 1. Length-weight regression relationships for sand seatrout and silver seatrout from selected studies in the Gulf of Mexico. Log transformations were performed on lengths (mm) and weight (g); the intercept is a and the slope coefficient is b for the regression.

Species	Measurement	Length range (mm)	Sex	a	b	Location
Sand Seatrout	TL	—	Male	-5.6609	3.2572	Texas[a]
	TL	—	Female	-5.6325	3.2420	Texas[a]
	TL	40-338	All	-5.4698	3.1715	Texas[a]
	SL	125-375	Female	-5.09429	3.11303	Texas[b]
	SL	135-350	Male	-5.12257	3.13121	Texas[b]
	SL	16-217	All	-4.6575	a.9572	Mississippi[c]
	SL	82-310	All	-4.46	2.86	Northern Gulf region[d]
Silver Seatrout	SL	26-188	All	-4.7582	3.0077	Texas[e]
	SL	14-186	All	-4.73352	3.00883	Mississippi[f]
	SL	77-280	All	-4.63	2.94	Northern Gulf region[d]

[a] Shlossman and Chittenden (1981).
[b] Moffett et al. (1979).
[c] Warren (1981).
[d] Sheridan et al. (1984).
[e] DeVries and Chittenden (1982).
[f] Warren et al. (1978).

Barger and Johnson (1980) examined otoliths, scales, and vertebrae from silver seatrout for indications of annulus formation; they found that the relationship between the number of marks on otoliths and TL in mm (X) was Y=206.00+11.65X (r=0.55). Back-calculated mean lengths at annuli on otoliths were 160 mm TL at the first annulus, 207 mm at the second, and 216 mm for the third.

The maximum size of 190 mm (SL) for silver seatrout reported by DeVries and Chittenden (1982) concurred with findings of previous studies (Hildebrand and Cable 1934; Gunter 1945; Christmas and Waller 1973). However, Franks et al. (1972) collected a specimen of 315 mm SL (380 mm TL) off Mississippi coastal waters.

DeVries and Chittenden (1982) estimated the maximum life span of silver seatrout to be 1-1.5 years, although fish may live to 2 years in the north-central gulf region. Annual mortality was calculated to be 99.83% (Table 1).

Length-weight relationships have been developed for silver seatrout from several areas of the gulf (Table 1).

Silver seatrout spawned in August and September grew fastest in June and September, averaging 25 to 30 mm SL/month (DeVries and Chittenden 1982). Growth slowed to 5 mm SL/month during December to March, but increased again by March through June to 15 to 20 mm SL/month. Waller and Sutter (1981) estimated fall and winter growth to be approximately 10 mm SL/month for silver seatrout in Mississippi waters, accelerating to 15 mm SL/month as water temperatures increased during spring.

THE FISHERY

Sand and silver seatrout are among the most common species caught in the northern Gulf of Mexico industrial bottom fishery (Roithmayr 1965; Warren 1981). Approximately 50,000 metric tons (t) of groundfish are landed annually for the production of pet food. In addition, about 300,000 t are harvested and discarded by commercial shrimpers from Pt. au Fer, Louisiana, to Perdido Key, Florida, and recreational shrimpers take an additional 50,000 t (Warren 1981). Commercial landing statistics (Bureau of Commercial Fisheries, National Marine Fisheries Service) for sand seatrout and silver seatrout are combined and listed as "white trout." However, Moffett et al. (1979) listed average landings for Texas, and range values for Florida, Alabama, Mississippi and Louisiana for 1952 to 1974.

The sand seatrout is an important recreational species throughout the gulf; however, data for the silver seatrout are limited. Recreational landing statistics for sand seatrout and silver seatrout (1979 only) are summarized in Table 2.

ECOLOGICAL ROLE (food habits)

Fish predominate in the diets of sand seatrout from the Gulf of Mexico (Reid 1954, 1955; Reid et al. 1956; Darnell 1958; Springer and Woodburn 1960; Sheridan and Livingston 1979; and Sheridan 1979). Several investigators have noted changes in diet relative to growth in length. Sheridan (1979) and Sheridan and Livingston (1979) found that mysid shrimp and calanoid copepods were the main diet of fish less than 40 mm SL in Florida waters, but fish became a more important part of the diet as sand seatrout grew larger. They also noted that location was important to sand seatrout diet; fish were heavily consumed near passes of the estuary, whereas mysidaceans were eaten more frequently in lower salinity areas.

Table 2. Summary of recreational fishing statistics for sand and silver seatrout in the Gulf of Mexico.

Species and time frame	Total U.S. catch (thousands of fish)	Percent of total catch taken from Gulf of Mexico	Catch by Gulf States (thousands of fish) FL	AL	MS	LA	TX
Sand Seatrout							
Jan-Dee 1979[a]	6,286	100	926	90	527	2225	2519
Mar-Dee 1981[b]	11,068	100	6711	—	716	723	2892
Jan-Dee 1982[b]	4,373	98.7	558	91	405	1891	1374
Jan-Oec 1983[c]	4,973	100	*	338	869	2532	1235
Jan-Dee 1984[c]	6,339	99.6	4367	142	430	1133	239
Jan-Dee 1985[d]	9,509	100	5114	237	1102	1459	1597
Silver Seatrout							
Jan-Dee 1979[a]	713	25.1	178	—	—	—	—

[a]U.S. National Marine Fisheries Service (1980).

[b]U.S. National Marine Fisheries Service (1985a).

'U.S. National Marine Fisheries Service (1985b).

[d]U.S. National Marine Fisheries Service (1986).

* means none reported.

-means less than 30,000 reported; however, the figure is included in row and column totals.

Moffett et al. (1979) found that the stomachs of sand seatrout 45-159 mm SL contained 38% crustaceans and 30% fish, whereas those specimens of 160-375 mm SL contained 46% fish (mostly the bay anchovy, Anchoa mitchilli), 10% crustaceans, and 1% annelids (percentages are frequencies of occurrence in fish with food items). Overstreet and Heard (1982) examined the stomach contents of sand seatrout taken from Mississippi Sound, finding the following percentages of occurrence (in fish with food items): stomatopods 3%, penaeids 53%, carideans 7%, and fishes 55% (mostly bay anchovies and gulf menhaden, Brevoortia patronus). Sheridan et al. (1984) examined sand seatrout taken throughout the northern gulf region and found that fish were the primary food, with the bay anchovy being the most frequently utilized species. Shrimp were also eaten, with Trachypenaeus and Acetes being most commonly observed.

Literature on the feeding habits of silver seatrout is not as extensive as that for sand seatrout. Rogers (1977) found that silver seatrout from west Florida and Texas consumed (by volume) 56% fish and 19% shrimp. Rogers also noted a shift in diet from 40% shrimp and 18% mysids for silver seatrout 26 to 50 mm long, to 77% fish and 8% shrimp for trout 76 to 175 mm long. Overstreet and Heard

(1982) reported that silver seatrout taken from Mississippi Sound consumed 83% fish and 41% penaeids (values indicate percent occurrence in fish with food items). Sheridan et al. (1984) found fish or shrimp to be the primary foods for silver seatrout in the northern gulf.

ENVIRONMENTAL REQUIREMENTS

Temperature

Larval and juvenile sand seatrout have been collected in water temperatures of 5 to 35 °C, but most are taken at temperatures above 10 °C (Christmas and Waller 1973). Small fish (less than 20 mm SL) were taken most frequently in Mississippi at temperatures of 25 to 30 °C, but were also found at temperatures as low as 15 °C (Warren and Sutter 1981). Copeland and Bechtel (1974), who examined catch records of sand seatrout from gulf coast estuarine systems concomitantly with several environmental factors, found a temperature range of 5 to 30 °C; optimum catches were made at 20 to 30 °C. Gallaway and Strawn (1974) noted that most sand seatrout in Galveston Bay were caught at temperatures of 29-32 °C (seines) and 25-32 °C (trawls), but some were taken at temperatures as high as 40 °C.

Adult silver seatrout are taken between 10 °C (Christmas and Waller 1973) and 30 °C (Gunter 1945), and juveniles are taken over the wider range of 5 to 30 °C (Swingle 1971). Silver seatrout were caught in Mississippi waters at temperatures between 10 and 30 °C; catches peaked at 25-30 °C (Waller and Sutter 1981).

Salinity

Small sand seatrout (less than 20 mm SL) were collected in Mississippi waters at salinities of 0-30 ppt (Warren and Sutter 1981). Christmas and Waller (1973) found larval and juvenile sand seatrout in salinities of 0-26 ppt. Warren and Sutter (1981) reported that the highest catches of larger young-of-the-year (20 to 90 mm SL) in Mississippi waters were at salinities of less than 15 ppt, the majority being taken in less than 10 ppt; larger fish (90 to 220 mm SL) were most frequently taken in salinities above 15 ppt. Adult sand seatrout have been taken in salinities up to 45 ppt (Simmons 1957; Roessler 1970).

Preferred salinities are higher for silver seatrout areas than for sand seatrout; adult silver seatrout have been taken at 7.5 ppt (Swingle 1971) to 38.6 ppt (Franks et al. 1972), but are most commonly found above 25 ppt (Swingle 1971; Warren et al. 1978).

Dissolved Oxygen

Information on relationships between dissolved oxygen and sand and silver seatrout tolerance or preferences is scarce. Benson (1982) noted an unreferenced study stating that sand seatrout tend to avoid water with less than 4.6 to 5.0 mg/l of dissolved oxygen.

Substrate

Early life stages of sand seatrout prefer soft organic bottom (Conner and Truesdale 1972), but adults are found over most substrates in estuaries and offshore. Gallaway and Strawn (1974) stated that habitat preferences of sand seatrout include oyster-reef substrates and water depths greater than 1 m.

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16. Abstract (Limit: 200 words)

Species profiles are literature summaries of the taxonomy, morphology, range, life history, and environmental requirements of coastal aquatic species. They are designed to assist in environmental impact assessment. Sand seatrout are one of the most abundant fishes in the estuarine and nearshore areas of the Gulf of Mexico. Although silver seatrout are also abundant, little research has been conducted for this species. Sand seatrout spawn in lower estuarine environments or in nearshore gulf waters with two spawning peaks; one in spring, and another in late summer. Silver seatrout follow a similar reproductive pattern. Sand seatrout are common in bays, sounds, and shallow offshore gulf water, while silver seatrout are more abundant in deeper waters. Both seatrout are important components in the industrial bottom fisheries; sand seatrout also are a valuable recreational species. Shrimp and other crustaceans are most commonly eaten.by small sand and silver seatrout, while larger fish shift to a more piscivorous diet. Small sand seatrout are usually found in waters with temperatures greater than 15°C and salinity values less than 15 ppt, while larger fish are found over a wider temperature range (5" to 30°C), and in salinities greater than 15 ppt. Silver seatrout generally prefer waters with salinities greater than 25 ppt with temperatures ranging from 5° to 30°C.

17. Document Analysis a. Descriptors

Estuaries
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